

[2, p. 52, 53].

The proposed strategy makes the foundation for designing one of the information system modules, which is directly related to BEP development [3].

Conclusion

In the context of rapidly changing work environment, there is the need to introduce

new technologies in all spheres of human activities. The proposed Strategy aimed at reinforcing employer engagement in the training process would allow universities to respond effectively to ever-changing workplace requirements and labor market needs.

REFERENCES

1. Motaylenko, L. Development of information model of forming basic educational programs in the light of professional competencies / L. Motaylenko, O. Poletayeva, S. Lyokhin // Environment. Technology. Resources: proc. 9th Int. Sci. and Pract. Conf., June 20–22, 2013. – Rezekne, 2013. – Vol. 2. – P. 30-33.
2. Motaylenko, L. V. Methodology of integrating education and professional community on the basis of information technologies / L. V. Motaylenko, D. I. Poletaev // Informatics and Education. – 2013. – № 9. – P. 51-54.
3. The software with web access “Evaluation of Graduate’s Competence” [Electronic resource]: technical description and presentation / developed by Poletaev D.I., Motaylenko, L. V.; Pskov State University. – [Program Code .02079939.00004-01 99 01; № 20698]. – Pskov, 2014. – 7 p. – URL: http://www.ofernio.ru/rto_files_ofernio/20698.doc, free. – Title from the screen (date of reference: 16.11.2015).

UDC 621.3:622

Collaboration Between Coal Mining Company and Higher Education Institute for Production Process Improvement

Far Eastern Federal University

Yu.S. Doroshev

“Novoshakhtinskoye”, Primorskugol

A.V. D’yakonov, E.E. Soboleva

Research Institute of Mining Safety and Efficiency (NIIOGR)

V.A. Khazhiev

The paper presents the experience of collaboration in engineer training between three organizations: the surface mine office “Novoshakhtinskoye”, Primorskugol, Research Institute of Mining Safety and Efficiency (NIIOGR), and Far Eastern Federal University (FEFU). Students are involved in searching for ways of production improvement through scientific and practical seminars which are held at FEFU with the participation of NIIOGR, and through work experience internship, where students are supposed to overcome particular production challenges. Engineering education, science, and production overlap at the annual scientific and practical forum “Mining School” held by Siberian Coal Energy Company (SUEK).

Key words: personnel policy, collaboration, personnel training, production improvement, work experience internship, seminar, scientific and industrial forum, Siberian Coal Energy Company.

Currently, the critical factor for national production improvement is graduates training since the average age of employees in the surface mine office “Novoshakhtinskoye”, Primorskugol, is considerable. If measures are not taken today, the average age will rise from year to year. Having participated in a number of vacancy fairs, the company failed to receive any positive feedback, which means there should be another way to attract graduates to the company.

The students’ interest in work in coal mining company arises from participation in the production safety and efficiency improvement project. This activity is carried out on the basis of the programs developed by the company’s managers and professionals. This collaboration between the company and university creates a kind of network when the potential employee is involved in production

improvement since his studying at the university (Fig. 1). For this purpose, since 2011, the highly qualified personnel of Primorskugol, NIIOGR, and professors and administration personnel of FEFU hold seminars for students of several specialties: mining machinery and equipment, open-pit mining, underground mining, geology and natural resources management (Fig. 2). This work with students includes the following steps: firstly, they are split into teams according to the attributed specialty or given position, then, within a team and on the basis of actual production data, they discuss various alternatives of production safety and efficiency improvement for the surface mine office “Novoshakhtinskoye”.

Being involved in these activities, students identify the improvements which can be made to increase the machine and staff capacity. This allows present-day students not only to become professionals,



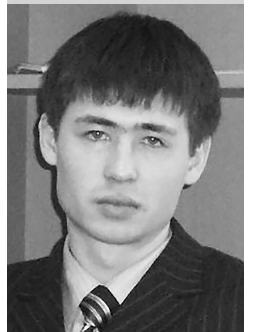
Yu.S. Doroshev



A.V. D'yakonov

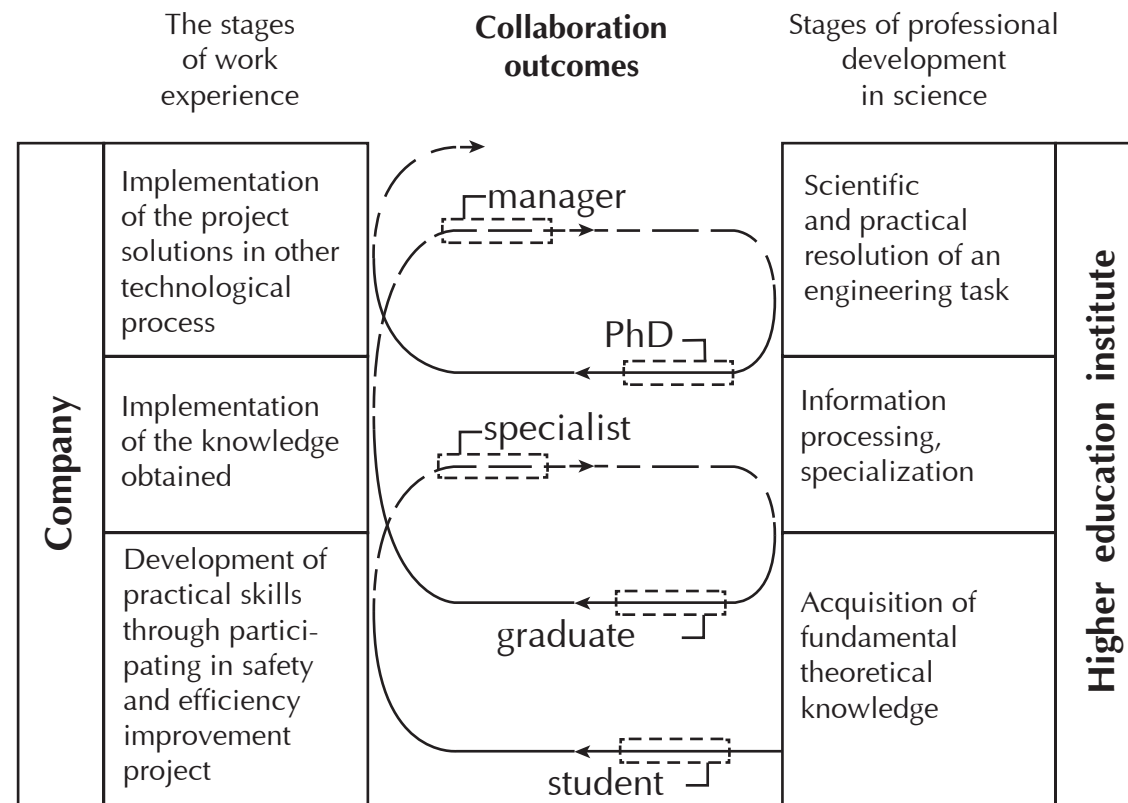


E.E. Soboleva



V.A. Khazhiev

Fig. 1. The scheme of collaboration between the company and the higher education institute for training highly qualified personnel



but also to try themselves as managers in charge of production process improvement.

The outcomes of analytics training and modeling seminars aimed at students' clear vision of production management and encouraging production process improvement are as follows:

1. Participating in the seminars, students realize that their experience and qualification are the qualities demanded in the labor market, since the employer highly estimates the positive result, i.e. benefits of production, rather than the actual amount of work performed.

2. The majority of students are full of positive energy, eager to work and assume responsibility for their deeds. However, students cannot see the ways of how to implement efficiently their knowledge and skills in production improvement.

3. The role of employers and educators is to help students conceive the way of life they want to live, understand which part they should play and what exactly should do to make their ideas come true. This will allow concentrating on the key issues – improving one's qualification, and as a result, having better quality of life.

4. The collaboration benefits have been identified:

for administration and professors of FEFU:

- cooperation with a big developing national coal and energy company, precisely, "SUEK", and its business unit Primorskugol;
- improvement of students' and university staff's qualification resulted from practical skills obtained in production enhancement; revision of

Fig. 2. The seminar held at FEFU with the participation of NIOGR and the critical review of experimental research carried out at the surface mine office "Novoshakhtinskoye" by the students of Department of Mining and Integrated Exploitation of Mineral Resources



educational materials and programs to make them meet the requirements of current production particularities and modern market;

- conducting scientific research on the basis of production data obtained;

for student of FEFU:

- acquisition of scientific knowledge and work experience for further development as a professional and manager;
- participation in production process improvement in Primorskugol;
- obtaining actual data from Primorskugol for further course works and the graduation thesis;

for Primorskugol:

- selecting perspective students and creating a reserve of potential young specialists;
- using students' potential to resolve engineering tasks within the project "Production Safety and Efficiency Improvement";
- establishing and developing relationships in scientific world (Fig. 2).

Primorskugol organizes workplace visits for students, within which the students have an opportunity to get acquainted with the top managers, see the workplaces and have all their questions answered (Fig. 3).

At the beginning of work experience

internship, there is a meeting of key managers and students devoted to the project on production safety and efficiency improvement, where each student can choose the engineering task the resolution of which he\she would like to contribute to.

The cooperative work lasts over two months. At the end of the summer work experience internship, at the special company meeting each student declares what he\she has managed to do:

- to reduce the risk of work-related injury;
- to improve equipment efficiency;
- to develop the employees' potential;
- to improve the production process and methods;
- to reduce non-productive time, etc.

When conducting this cooperation, it is essential for the students of different years of studying to work on a team with professionals and share the mutual task, i.e. development through learning. For this purpose, every morning students have a number of tasks to plan their working day and every evening the day outcomes are analyzed for probable plan revision. As a result, the students can really contribute to the production process instead of being a burden for the employees in charge, who used to perceive internship as a waste of time

Fig. 3. The workplace visit in the surface mine office “Novoshakhtinskoye” by third-year students of the Department of Mining and Integrated Exploitation of Mineral Resources, FEFU



and efforts. The youth have an opportunity to try to work in a coal mining company, identify their role in the production process and think over possible professional and career development. It is also possible to identify those who are ready for continuing professional development and to involve motivated students into the projects on open-pit mining improvement.

Collaboration with the university students contributes to the company's intangible asserts as PhD thesis can be prepared and successfully defended (for example, in October, 2013 the PhD thesis was defended at Moscow State Mining University [1]).

Scientific and methodological support is provided with the materials developed at FEFU, where scientific seminars are held to test the scientific and practical outcomes obtained by the managers and specialists of coal mining industry in the course of production process improvement (Fig. 2).

Currently, the company professionals are conducting scientific research under the supervision of the professors of the Department of Mining and Integrated

Exploitation of Mineral Resources, FEFU, on the topics as follows:

- developing competitiveness of open-pit mining on the basis of production complexes of equipment and personnel;
- developing the mine captain's professional potential;
- coal mine excavator reliability on the basis of production operation enhancement;
- improving coal mining company production on the basis of the overman's continuing professional development;
- the rationale for the use of hydraulic excavator with a backhoe bucket for open-pit mining under various geological conditions;
- improving mining excavators reliability.

FEFU professors comment upon these works and make suggestions on the structure and content, which determines the further research.

As the result of the collaboration mentioned above, it is possible to

Fig. 4. The Agreement on scientific and industrial cooperation between Primorskugol, FEFU, and NIIOGR (Chelyabinsk)



conclude that one of the ways to develop the company potential is to use human resources efficiently. This can be achieved through employing highly qualified personnel, whose training the company has contributed to. Today, Primorskugol is operating a scheme of selecting the graduates for employment. The main difficulty is to assess the employee's potential and motivation for job. Hiring an intern, it is important to find out whether he/she meets the corporate requirements. The potential employees in demand are determined and hard-working students, who manage to combine the work with studies. If a student is ready for personal development, the employer will be interested in employing such a person.

One the significant outcomes of collaboration between the coal mining company and the university is the increase in the number of students on internship in the surface mine office “Novoshakhtinskoye”, from seven persons (2008-2010) to 68 (2011-2013). The mutual task of the company and university is to involve students in personal fulfillment, make them resolve production tasks, without explaining the particularities of the profession, but

making students comprehend this through conducting professional activities. Being the participators but not the spectators of the production process, six interns have won the competition “Gold Personnel Reserve of SUEK” [2, 3], which was held to promote creative and innovative, identify perspective ideas and projects for the development of coal mining industry, to create a human resources policy of SUEK. The next step in collaboration between FEFU and Primorskugol is the development and implementation of cooperation procedure.

The overlapping of educational process, science, and production takes place at the annual scientific and practical forum “Mining School” held by SUEK. This year the forum took place for the fourth time on the bank of Murav'inaya harbor, Artem [4, 5]. The forum was organized by the non-profit partnership “Youth Forum of Mining Leaders”, the fund “Nadezhnaya smena”, and SUEK with the support of the RF Ministry of Energy, Ministry of Education and Science, Ministry for Development of Russian Far East, Agency for Strategic Initiatives, and the Administration of Primorsky Kray.

The aims of the School are to support the professional development of students and young employees of the mining industry and to assess their potential for work.

The School goals are as follows:

- to develop professional and leadership skills, improve knowledge and competencies of perspective young employees;
- dissemination of principles of economical production and operational efficiency improvement;
- to encourage the implementation of young employees' technical innovation proposals, to involve young specialists in resolving scientific, engineering, and economic tasks, which are challenges for the company and the whole industry;
- to encourage sharing knowledge and experience within the company;
- to contribute to professional unity and being proud of being in the industry through development of skills and acquisition of knowledge necessary to take feasible engineering and economic solutions, to conceive and design;
- to contribute to moral, intelligence, and physical development of young employees;
- to build a strong team spirit, improve the company's image, promote mining professions and mining engineering education.

The Forum participants are young employees of SUEK, FEFU students and post-graduate students working in SUEK, winners and participators of The National Championship in Resolving Fuel and Energy Cases, student of Chegdomynsk Mining College, young employees of mining companies in Primorsky Krai, totally, 11 teams, each of 15 members.

The educational program of the School comprises professional education, acquisition of operational improvement knowledge, and personal development (i.e. development of leadership skills and management skills, efficient work

principles, etc.). The program includes:

- engineering case studies,
- business games and trainings;
- master classes by the experts of mining industry;
- team building activities;
- sport and creative activities.

The key teaching technology is engineering case study which stipulates team work in resolving a task on production and operational improvement for a certain company under particular economic and working conditions.

Two weeks in advance, the teams received a case developed on the basis of SUEK data.

During the School, two cases were proposed: open-pit mining and underground mining. As for the first case, Borodinsky open-pit coal mine was suggested and the engineering tasks were as follows:

1. to analyze the mining methods used in Borodinsky open-pit coal mine and assess their efficiency;
2. to analyze the mining equipment performance and assess the capacity relative to the equipment with due regard to the plan of 26 million ton production increase by 2026;
3. to suggest the most efficient mining method and develop a project on equipment performance improvement and mining operations enhancement in Borodinsky open-pit coal mine;
4. to distribute the load among excavators and coal beds, with the open-pit coal mine production of 26 million tons;
5. to develop the cost breakdown structure for innovations implementation.

As for underground mining, there were engineering tasks on the mine site "Polysaevskaya": the mine is located in the central part of Leninskiy coal region in Kuzbass and is developed by the company "Mine Site Polysaevskaya", SUEK-Kuzbass. The tasks were as follows:

1. to analyze stoping technology in the mine "Polysaevskaya", including stope capacity, and assess the efficiency of the

Fig. 5. Two extra hours to resolve supplementary tasks within the case study



technology;

2. to suggest a project on stoping technology improvement and coal production increase, exclusive of such a factor as air supplied to the mine;

3. to suggest a project on coal production increase and make an assessment whether it is technically and economically feasible to maximize the production;

4. to develop the cost breakdown structure for innovations implementation.

The engineering tasks suggested for the teams can be addressed by the staff of research and design institutes but the

School participants managed to do it as well.

On the second and third School days, the teams got supplementary tasks to resolve within two hours (Fig. 5).

Besides case studies, the participants attended lectures and seminars, met industry experts and supervisors, discussed the issues of production process improvement and personal professional development (Fig. 6). The knowledge acquired through these activities was quite helpful to resolve the above-mentioned cases.

Participating in the School activities, the

Fig. 6. Professor of FEFU Engineering School as a lecturer at the forum "Mining School 2015"



Fig. 7. Professors of FEU Engineering School as experts at the forum “Mining School 2015”



teams got scores, which were daily counted by the jury of 31 experts from the different parts of Russia (Fig. 7).

The winner is the team which gained more scores than the others over the School time. On the first School day, the order of teams performance was established through the draw.

The outstanding event “Mining School 2015” was held on July 6–11, 2015, and currently it is time for reflecting on the experience and preparing for the next forum in 2016. All the participants of “Mining School 2015” were fully satisfied with the event organization: from 7 a.m. till 1 a.m. there were different intelligence and sport competitions, meetings, KVN, and disco parties. There also was an exhibition of mine rescue equipment. The competition in humor “Soviet movie”, where the participant made their creative performances, lasted till midnight and made everyone laugh till they cried. The excursions to Voroshilovskaya Battery and Fort № 7 were of great importance for the patriotic education of youth.

Though the forum had its winner, the team “Primorye Mineworkers”, no one lost since everyone acquired new

knowledge, experience in communication and team work, built personal motivation to professional development, and got unforgettable impressions.

Conclusion

The current national and global economic environment, the decrease in solid fuel production, rise in the average age of employees, and aging of equipment make coal mining companies look for new ways of production safety and efficiency improvement and attract perspective young workers and students to coal mining industry. Today, it is the time for collaboration between the coal mining company, university and NIIOGR, when the employee is involved in the production process since the time of the university studies. The overlapping of educational process, science, and production takes place at the annual scientific and practical forum “Mining School” held by Siberian Coal and Energy Company. This forum significantly contributes to professional education and personal professional development, as well as to the identification of creative and initiative youth who can become the industry leaders.

Fig. 8. Supplementary task presentation and defense by the students of FEU Engineering School



REFERENCES

1. Dyakonov, A. V. Defence of A.V. Dyakonov’s Thesis: Development of Functional of Head of Section in Order to Improve Production Efficiency and Safety in Coal Strip Mine // Coal. – 2013. – № 11. – P. 64-67
2. he results of the competition “Gold Personnel Reserve–2013” [Electronic resource] // Fund “New Eurasia” [website]. – Moscow, 2008–2013. – URL: <http://www.neweurasia.ru/news/3149>, free. – Title from the screen (date of reference: 02.12.2015).
3. Regulations on the competition “Gold Personnel Reserve of SUEK” [Electronic resource] // Buryat State University [official website]. – Ulan-Ude, 2006-2014. – URL: <http://old.bsu.ru/?mod=news&nid=5525>, free. – Title from the screen (date of reference: 02.12.2015).
4. Forum “Mining School 2015” takes place in Primorye [Electronic resource] // The Administration of Primorsky Kray [official website]. – [Vladivostok], 2015. – URL: <http://primorsky.ru/news/common/82612>, free. – Title from the screen (date of reference: 02.12.2015).
5. Scientific and practical forum “Mining School 2015” in the summer camp “Junost”, Primorye (PHOTOS) [Electronic resource] // BezFormata.Ru – 2008-2015 [website]. – URL: <http://vladivostok.bezformata.ru/listnews/lagere-yunost-v-primore-foto/35103899>, free. – Title from the screen (date of reference: 02.12.2015).